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ABSTRACT

This booklet, one of a series developed by the Frederick County Board of Education, Frederick, Maryland, provides an instruction module for an individualized or flexible approach to 7th, 8th, and 9th grade science teaching. Subjects and activities in this series of booklets are designed to supplement a basic curriculum or to form a total curriculum, and relate to practical process oriented science instruction rather than theory or module building. Included in each booklet is a student section with an introduction, performance objectives, and science activities which can be performed individually or as a class, and a teacher section containing notes on the science activities, resource lists, and references. This booklet introduces the pupil to the study of plant life. The estimated time for completing the activities in this module is 3-4 weeks. (SL)

AIDS TO INDIVIDUALIZE THE TEACHING OF SCIENCE

Marvin G. Spencer

MINI-COURSE UNITS

BOARD OF EDUCATION OF FREDERICK COUNTY

1973

Frederick County Board of Education

Mini Courses for

Life, Earth, and Physical Sciences

Grades 7, 8, and 9

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1973

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FOREWORD

The contents represented in these modules of instruction, called mini courses, is an indication of our sincere desire to provide a more individualized and flexible approach to the teaching of science.

Data was accumulated during the school year relative to topics in life, earth, and physical science that were felt to be of greatest benefit to students. The final selection of topics for the development of these courses during the workshop was made from this information.

It is my hope that these short courses will be a vital aid in providing a more interesting and relevant science program for all middle and junior high school students.

Dr. Alfred Thackston, Jr.
Assistant Superintendent for Instruction

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PLANTS - THE "OTHER" LIVING THINGS

Prepared by

Sharon Sheffield

CONTENTS

Estimated Teaching Time

3-4 weeks

PLANTS - THE "OTHER" LIVING THINGS

INTRODUCTION:

Take a walk around your home, on the school grounds or in the park. Thousands of living organisms keep you company, not just the organisms like yourself - the animals who fly around you and scurry from your approach -- but the living world of trees and grasses -- flowers and "weeds".

Have you ever really thought about plants as living organisms like yourself? You know they grow because you may have planted seeds or small plants in a garden or flower pot. You probably checked your plant from time to time but really paid very little attention to it until it reached its grown-up stage and displayed a flower or fruit.

Did you ever wonder how water gets from the soil into the plant? from one part of the plant to another? Did you ever think about the body plan of a plant? What structures do they have? Why? How do they work?

Can you list five things all plants have in common? Can you identify some unusual characteristics of plants? Can you describe how a plant grows? Do you know why some plants can live in the desert and others can't? Do you know why some plants lose their leaves and others don't? Do you know how plants breathe? Did you ever see a plant cell?

This unit is designed to introduce you to the fascinating world of plants. For some of you this may be a first time experience but don't be afraid! Plants are every bit as friendly as animals and just as much fun! Are you ready? Let's go!

OBJECTIVES: (what I hope this unit will do for you!)

A. Generally

1. To acquaint the student with the world of plants.
2. To appreciate plants as living organisms.
3. To make observations about plants and to draw conclusions from these observations.
4. To increase your awareness of the living world.
5. To become familiar with plant structures.

B. Behavioral Objectives (what you should be able to <u>do</u> at the <u>end</u> of the unit)

Each student should be able to:

1. identify the roots, stems, and leaves of any plant presented with 80% accuracy.
2. distinguish between fibrous and taproot systems in function and in examples presented to you.
3. determine the type of root system best suited to these environments:
   1. desert; 2. rocky; 3. aquatic; 4. windy; 5. sandy
   Each decision should be supported by factual evidence.
4. describe the function of root hairs, xylem and phloem, and cambium tissue.

5. identify a terminal bud, lateral bud, lenticel, leaf scar and node on two of three stems presented to the student.
6. prepare a cross section of a woody stem showing an annual ring.
7. identify a monocot and dicot stem in cross section (prepared slide) by the arrangement of vascular bundles.
8. differentiate between an underground stem and a root.
9. identify three simple and three compound leaves.
10. locate the blade, peliole, margin, midrib and type of veins in a sample leaf.
11. prepare a cross section of a leaf showing the upper epidermus, palisade layer, spongy layer and vein.
12. prepare a slide showing a stomata in a leaf and explain its function.
13. identify the parts of a lima bean seed and compare them with the parts of a corn seed.
14. reconstruct the development of a bean plant.
15. compare the functions of roots, stems and leaves. Relate these functions to their structures.

ACTIVITIES:

A. A Plant Comparison (Instructions follow!)

Around the room are a number of plants collected by your teacher. Visit each plant. Observe it by using your eyes, nose and fingers. If you need a hand lens, one will be provided. Do not dismantle the plant! Leave it as you found it for the next investigator. Write down all the observations you make. Add any new thoughts to the table on the board.

When the table is complete, your teacher will help the class compile a table on similarities and differences of plants. Make a copy for yourself.

List 5-10 conclusions you can draw from the information in the table about plants.

B. LAB - What are the main parts of corn and bean seeds? Instructions for this are provided on a separate lab sheet from your teacher. Be sure you answer the questions and make drawings where asked for.

C. Plant a lima bean! (Instructions follow)

Each of you should bring in a large baby food jar (or one of comparable size). Soak your bean seeds overnight before planting. Now wrap a paper towel around the inside of your jar. Then loosely pack sawdust inside the paper towel (this helps to support your seed and keeps it moist). Place your soaked seeds between the paper towel and the jar. Add enough water to keep the towel moist. Do not allow the bean to dry out. As your seed germinates, you have a perfect window for viewing. As things happen, keep an account of what is occurring.

Note: Be sure your jar has your name and date on it.

D. LAB - Observing a Young Root

Instructions are provided on a separate sheet from your teacher. Keep accurate records and data.

E. Do some research! (read from a book)

You may choose from these - just one!

1. Living Things, pp.202-207 (roots of plants)
2. Life Science - A Modern Course, pp.90-92

Answer these questions:

1. What are the main functions of roots?
2. Where does growth take place in the root?
3. What is the root cap? What is its job?
4. What are root hairs? How do they aid the plant?
5. What are the main types of root systems?
6. What structures help water and food move through the plant?

F. LAB - Let's Dissect a Carrot! (Instructions right here!)

For this lab you will need - you guessed it - a carrot!

Observe your specimen. Write down the observations you make. From your knowledge of roots -- what kind of root is the carrot? Make a sketch of your specimen. The little projections along the sides of the carrot are called secondary roots. Remember these!

Now -- you're ready to dissect. You want to slice the carrot longitudinally (not like bologne is sliced but like a submarine roll is cut). Check with your teacher before you cut. Then slice the carrot from the top (thick end) to the bottom (thin end).

Look at your section of the root. It looks as if it has two parts -- and it does! The central portion is called the central cylinder. The tubes which carry water up the plant and food down are found here. Can you find the secondary root? Make a sketch of your section and label the central cylinder and the secondary root.

Try to separate the central cylinder from the rest of the carrot (which is called the cortex). This can be done by prying the cylinder loose with your fingernail or scalpel. Look for the secondary roots. Why do you think they originate here rather than in the cortex?

G. LAB - External Anatomy of a Stem (Instructions right here!)

Collect 5-10 twigs from different trees or bushes. Bring them into the lab. Using the available references find the terminal bud, lateral bud, lenticel, leaf scar and node of the twigs. Attach the twigs to a piece of tagboard and label them.

At the bottom of your chart make a key identifying the structures you labeled.

H. LAB - Cross Section of a Woody Stem (Instructions right here!)

Now that you have seen the outside of your stems - let's look at the inside. To do this we are going to make a cross section of a stem. (Remember this type section resembles a slice of bologne.)

Use one of the twigs your teacher will provide. Using a single edged razor blade slice off the end of the twig. Discard this piece. Now slice another section almost paper thin. Place this piece in a drop of water on a slide. Cover with a coverslip. Focus your slide under low power of the microscope. Can you find an annual ring? These are alternating layers of large and small cells sometimes referred to as layers of wood. Compare your slide with the references available. Check with your teacher to make sure you have an annual ring.

I. LAB - Where is Water Transported in a Celery Plant?

Instructions are provided on a separate sheet from your teacher. Keep careful data and records.

J. Observe the slides of monocot and dicot stems on demonstration. How are they different?

K. Do some research -- Read from a book! (Remember - only one!)

1. Living Things, pp. 197-203
2. Life Science - A Modern Course, pp.93-95

Answer these questions:
1. What are the main functions of stems?
2. Why is vascular tissue sometimes called the plumbing system for a plant?
3. What is an underground stem?
4. How can you discover the age of a tree?
5. What kind of tissue is found in the root and the stem of a plant? Why?

L. LAB - Let's Study Leaves! (Instructions right here!)

Collect 5-10 different leaves. Compare them to the demonstration leaves. Arrange them on a piece of tagboard (as you did the twigs). Label the midrib, the margin, the petiole, the blade and the vein pattern in each of your specimens. Decide if your specimen is simple or compound.

Now using one of the leaves available in the lab prepare a cross section of a leaf. Find the epidermis, palisade layer, spongy layer and the midrib. Make a sketch of the section and label it.

1. Why do you think the cells in the palisade layer are so close together?
2. What do you think the epidermis does for the leaf?
3. What advantage is there in having spaces in the spongy layer?

M. LAB - A Breath of Air (Instructions are provided on a separate sheet from your teacher)

N. Read a Little!

1. Living Things, pp. 193-196
2. Life Science - A Modern Course, pp.95-96

Answer these:
1. What advantage is it for a tree to lose its leaves in the fall?
2. Why do leaves turn yellow in the fall?

O. The Plant as a Whole! Can you answer these?

1. Which kind of plants, one with tap roots or those with fibrous roots, might live best in an area with a lot of wind?
2. How do plants with fibrous root systems help prevent the wearing away of the soil?
3. Sugar maple trees are tapped by drilling holes into the outer layers of the trees. This allows the sap from which maple sugar products are made to be collected. In doing this tapping, what tubes do the people reach? If they drill too deeply, the sugar is less concentrated? Why?
4. Trees may be killed by a process called girdling. In this, a ring is cut around the tree. How deep must this ring extend into the wood? Why would this kill a tree? How could extra large fruits be produced by partial girdling?
5. After some time the leaves of your celery stems that have been placed in colored water will show leaf coloration. How did the color get into the leaves? What does this show about the vascular bundles in a plant?

Extra Credit (If you have time!)

You may get instructions for these from your teacher. Do one or all.

A. Labs
   1. Where does growth take place in a root?
   2. What effect does gravity have on plant growth?
   3. Plant cells - respiration
   4. Plant cells - transpiration

B. Research
   1. Prepare a display of leaves and twigs. Identify them as to name.
   2. Prepare a report on plant diseases.

Note to Student: From time to time your teacher will present some audio-visual material to you (films - filmstrips). These will help to supplement (add to) your learnings. Don't forget to talk with your teacher about all of your work. Remember - teachers are there to help students!

EVALUATION:

When you have finished this unit and are ready to find out how much you have learned - see your teacher. He/she will give you an evaluation exercise. Part of it will be practical and part will be written All of it will be fair!

CONCLUSION:

Look back to the objectives. Was your adventure with plants successful? Good! Let's go on!

Notes on Activities (Letters correspond to student activities listed in student section.)

A. Plants should be collected and if possible identified by you. Choose a wide variety of plants that represent many of the characteristics you are looking for.

The chart should be compiled in class discussion -- but not the conclusions. These are for the students.

*B. From Life Science - A Problem Solving Approach, pp. 194-196.

C. Materials needed:
soaking jars (beakers)
Kentucky Bush Beans should be used instead of limas
towels
sawdust
masking tape (for names)

*D. From Interaction of Man and the Biosphere, page 86.

E. You may substitute other comparable reading materials.

F. Materials needed:
single edged razor blades
reference chart of parts of carrot

G. Need reference chart or book showing parts of stem. Also tagboard, Elmer's Glue and felt tip pens.

H. Dogwood twigs (be sure they have annual rings) make good sections easily. Keep in water so they stay fresh. Once again single edged razor blades are good especially new ones. A reference book showing annual rings is helpful here.

*I. From Life Science - A Problem Solving Approach, pp. 249-251.

J. Demonstration of monocot and dicot stems in cross section. Be sure you discuss differences with students.

K. Once again - substitute if necessary.

L. As with G., chart or references needed here. Also demonstration leaves. Thick leaves make better sections than thin ones.

*M. From The Living Scene (Search) pp. 18-21. Available from supervisor's office.

*Note: You will have to modify these labs to meet your students' needs and prepare copies for them. Don't forget to tell students where they may find the materials for each lab.

N. Substitute if necessary.

O. May be difficult for some - small discussion groups may be helpful here.

Extra Credit

*A. Labs
1. From Life Science - A Problem Solving Approach - pp. 213-215.
2. From Life Science - A Problem Solving Approach - pp. 216-218.
3.} From Life Science Skillcards, Merrill Publishing Company
4.}

II. Audio-Visual Aids

1. Available from IMC

Films:

F121	Growth of Seeds	13 min.
F35	Life of a Plant	11 min.
F50	Plants that Grow from Leaves, Stems, and Roots	11 min.
F751	Plants That Live in Water	11 min.
F95	Roots of Plants	10 min.

Filmstrips:

FS580 (series)
- Roots of Plants (Roots)
- How Seeds Sprout and Grow into Plants
- Leaves of Plants
- Green Plants
- Stems of Plants (Stems)
- Parts of Plants
- Life Cycle of Plants

FS500 (series)
- Finding Out About Green Plants
- Finding Out About Seeds, Bulbs, Slips
- Finding Out How Plants Grow

FS581 Seeds Grow Into Plants

2. From Governor Thomas Johnson High School

Filmstrips:

B-2	Life Cycle of a Plant
B-23	Leaves of Plants
B-31	Stems of Plants
B-34	Roots of Plants
B-71	Monocotyledons
B-72	Dicotyledons

Single Concept Film Loops

S-190	Germination I (Corn)
S-191	Germination II (Bean)

It is suggested that the teacher evaluate and use these A-V materials where he/she feels they are appropriate. Remember an A-V aid is most effective when students use the information presented in some way, so prepare accompanying exercises for them!

I. Evaluation

It is suggested that the teacher determine the evaluation. It might include both practical and written work.

Evaluation Form for Teachers

1. Name of the mini course _____

2. Was this unit appropriate to the level of your students?

3. Explain how this mini course was used with your students. (Individual, small group, or total class)

4. Identify the plus factors for this course.

5. List the changes that you would recommend for improvement.

7. Did you use any other valuable resources in teaching this unit? If so, please list.

PLEASE RETURN TO SCIENCE SUPERVISOR'S OFFICE AS SOON AS YOU COMPLETE THE COURSE.

ADDITIONAL SCIENCE MINI-COURSES

LIFE SCIENCE

	Prepared by
A Study for the Birds	Terrence Best
Creepy Critters (Snakes)	Terrence Best
How's Your Plumbing?	Paul Cook
Guess Who's Been Here for Dinner	Paul Cook
Plants - The "Other" Living Things	Sharon Sheffield
Let's Look at You - The Human Organism	Sharon Sheffield
Classification: Why is There a Need?	Melvin Whitfield
Protist: The "Unseen" Kingdom	Melvin Whitfield

EARTH SCIENCE

Coastline Development	Nelson Ford
Ocean Currents	John Fradiska
Features of the Ocean Floor (Ocean Floor Topography)	John Fradiska
Space and Its Problems	John Geist
Invertebrate Fossils: Clues to the Distant Past	John Geist
An Attempt towards Independent Study in Astronomy	John Geist

PHYSICAL SCIENCE

Household Chemistry	Ross Foltz
Notions on Motions	Kenneth Howard
Environmental Chemistry	Fred Meyers